MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for May, 1905, is based on data from about 3583 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 176; West Indian Service, cable and mail, 4; River and Flood Service, regular 52, special river and rainfall, 363, special rainfall only, 98; cooperative observers, domestic and foreign, 2565; total Weather Bureau Service, 3258; Canadian Meteorological Service, by telegraph and mail, 33; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 1; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25. Total, 3583.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S.I. Kimball, General Superintendent of the United States Life-Saving Service; Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; and Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that at regular Weather Bureau stations all data intended for the Central Office at Washington are recorded on seventy-fifth meridian or eastern standard time, except that hourly records of wind velocity and direction, temperature, and sunshine are entered on the respective local standards of time. As far as practicable, only the seventy-fifth meridian standard of time, which is exactly five hours behind Greenwich time, is used in the text of the REVIEW. The standards used by the public in the United States and Canada and by the cooperative observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich.

Barometric pressures, whether "station pressures" or "sea-level pressures", are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

Since December, 1904, the Weather Bureau has received an average of about 1700 reports from as many observers and vessels, giving international simultaneous observations over the Atlantic and Pacific oceans at 12 noon, Greenwich time, or 7 a. m., seventy-fifth meridian time. These are charted, and, with the corresponding land observations, will form the framework for daily weather charts of the globe.

In conformity with Instructions No. 43, March 29, 1905, the designation "voluntary", as applied to the class of observers performing services under the direction of the Weather Bureau without a stated compensation in money, is discontinued, and the designation "cooperative" will be used instead in all official publications and correspondence.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The disturbances that advanced from the American Continent over the western Atlantic were of slight intensity. In the vicinity of the Azores barometric pressure was high, except from the 15th to 20th, when that region was occupied by a depression that appeared to pass thence over Portugal and Spain. The advance of depressions over the eastern Atlantic was attended by low pressure over the British Isles on the 1st to 3d, 10th, 11th, and 18th to 20th, and pressure fluctuated in that region from the 27th to 31st. From the 4th to 9th, and 12th to 17th the barometric pressure was high over and near the British coasts.

In the United States the more important barometric disturbances advanced from the middle Plateau and middle Rocky Mountain regions over the central valleys and the Great Lakes. The effect of the development and presence, during a great part of the month, of depressions in the western mountain and Plateau districts was an alternation of periods of precipitation and low temperature over the western half of the country. In the Plateau and western mountain districts the precipitation was partly in the form of snow. During the early part of the month frost and freezing temperatures occurred as far south as northern New Mexico and northern Arizona. The western depressions lost intensity in crossing the central valleys and the center of but one low area, No XII, advanced over the Southern States east of the Mississippi.

In several instances the eastward advance of low areas was attended by tornadic storms in the Middle West and Southwest. One of the most important of these storms occurred on the night of the 8th at Marquette, Kans., and the most destructive tornado of the month visited Snyder, Okla., the evening of the 10th. In each instance the tornado occurred in the eastern quadrant of a barometric depression that advanced over Colorado and Kansas.

In the early part of the month, bottom lands along the Brazos River between Hearne and Richmond, Tex., were flooded, the damage being lessened by timely warnings. At the close of the 2d and in the early part of the 3d decade water stages were high in the rivers and streams of the middle and lower Ohio Valley, and during the latter part of the month flood stages were reached in the Arkansas and Red rivers in western Arkansas and northwestern Louisiana, and in the Rio Grande in New Mexico. The high stages of rivers and streams and the warnings issued in connection therewith are discussed under the heading "Rivers and Floods."

The following from the Rocky Mountain News, Denver, Colo., of May 30, 1905, shows results accomplished in the

newly organized Rio Grande Valley extension of the Weather Bureau River and Flood Service:

The Weather Bureau's scope of usefulness has been largely increased by the preparation and issuance of bulletins on the rise of the various rivers in Colorado and New Mexico, and hereafter the farmers will have no excuse for losses of crops by floods of which they had not been warned.

The new system was inaugurated on May 1, and bulletins were furnished to points along the Rio Grande River. Every rise was foretold from two to five days ahead, and the height was given within a tenth of a foot. The residents of Albuquerque, Rincon, Las Cruces, and other points were warned of the floods, which occurred Saturday and Sunday, as early as last Thursday.

On Thursday of last week a bulletin was telegraphed to El Paso that the Rio Grande River would reach its highest point of the season yesterday and that it would reach a height of 13.7 feet. Yesterday afternoon Forecaster Brandenburg received a telegram from El Paso stating that the river had reached the height of exactly 13.7 feet.

At the same time Rincon, Las Cruces, Engle, Socorro, and Albuquerque were warned that the river would reach the same height as that reached in the memorable flood of last October. The warning was heeded to a certain extent, and where it was the damage was minimized.

The success of the system has resulted in ordering a similar service for the Arkansas River east of Pueblo, including the Purgatoire, or the Picket Wire, as it is called, from Trinidad to Las Animas. The service will also be installed on the Pecos River in eastern New Mexico and western Texas, and on the Canadian River.

BOSTON FORECAST DISTRICT.

The month, as a whole, was dry, cold, and unpleasant for the season of the year. Snow fell in many sections on the 1st, with amounts ranging from a trace to several inches. Frosts occurred throughout the section, particularly on the 24th, and in parts of the Northern States the ground froze and ice formed on still, shallow water. In sections where the cold was severe, vegetation was not sufficiently advanced to suffer much damage. The small amount of precipitation was the most conspicuous feature of the month. The average for the month for the entire district, 1.82 inches, is the smallest for May in the history of the New England Weather Service, except 1.79 inches in 1899, and 0.68 of an inch in 1903, and it is a little more than 50 per cent of the normal for the month. The month was devoid of severe storms or high winds and gales. There was, however, more than the usual amount of fog, of which there was considerable complaint. No storm warnings were issued during the month and there was no delay to shipping by reason of high winds.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

No general storm appeared in the district during the month and no special warnings were issued. Severe local storms occurred on several dates and forecasts for thunderstorms had been issued in nearly every instance. The latter part of the month was unusually wet over a great part of the district.—*I. M. Cline, District Forecaster.*

CHICAGO FORECAST DISTRICT.

The upper Lakes were comparatively free from storms. Storm warnings were ordered on only a few dates during the first half of the month, and, as a rule, only the lighter craft were inconvenienced, and no wrecks occurred as far as known. Frost warnings were issued on several dates and the cranberry growers of Wisconsin were carefully advised previous to the occurrence of each frost.—*H. J. Cox, Professor and District Forecaster.*

LOUISVILLE FORECAST DISTRICT.

There were no severe or damaging storms in the district, although a number of thunderstorms occurred, attended by heavy rainfall, and some by hail. Light frost occurred in the extreme northern portion of the district on the morning of the 1st, and a cool spell prevailed from the 15th to 20th.—*Ferdinand J. Walz, District Forecaster.*

DENVER FORECAST DISTRICT.

The month was cold throughout the district, with an excess of precipitation in the northern part and a marked deficiency on the southern slope. Vegetation remains backward, owing to the frequent frosts, nearly all of which were forecast. The cooler weather retarded the melting of snow in the high mountains of Colorado, but on the southern slope, where high temperatures prevailed, there was a rapid melting of snow even at the highest altitudes. Streams were badly swollen from the beginning of the month; destructive floods, warnings of which were timely, occurred in the lower Rio Grande during the latter half; during the closing days of the month points below San Marcial were advised that the water would reach or come within one foot of the flood of last fall. At El Paso active preparations were made for the flood and all possible steps were taken to minimize damage.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

Unsettled weather prevailed throughout the month. Heavy rainfalls occurred and over the southern half of the Sierra Nevada Mountains the snowfall was heavy.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

No severe general storm passed over the district. Local storms, accompanied by heavy rainfalls, occurred frequently in the mountain districts, and some loss of life and considerable damage to farm property was caused in some localities by sudden floods sweeping down the steep canyons. Frost warnings were issued to points east of the Cascade Mountains when conditions demanded them, and as a rule the warnings were successful.—*A. B. Wollaber, Acting District Forecaster.*

RIVERS AND FLOODS.

The moderate floods in the Texas rivers continued during the first few days of the month, and additional warnings were issued May 1. The heavy rains of the 13th and 14th started another decided rise, and warnings of dangerous rises in the Brazos and Trinity rivers were issued on the 14th and 15th. The stages reached were from two to nine feet above the danger lines, but it is thought that no serious losses occurred, except such as were absolutely unavoidable. The rivers continued comparatively high over their lower reaches until the end of the month.

The Red River was high throughout the month as a result of the numerous heavy rains, and warnings were first issued on the 13th. The danger line of 28 feet was passed at Fulton, Ark., on the 16th, and by the end of the month the entire river from Fulton southward was from 2.5 to 3.5 feet above the danger line. A full report of this flood will appear in the REVIEW for June, 1905.

The lower Arkansas, White, Ouachita, and Atchafalaya rivers were also in moderate flood, and stages several feet above the danger lines were quite general, except in the Arkansas River. The usual warnings were issued for these floods.

There were heavy rains and snows over the mountainous upper watershed of the Rio Grande beginning about the 15th, and on the 18th it became necessary to issue another flood warning to points between Albuquerque, N. Mex., and El Paso, Tex. Supplementary warnings were issued almost daily thereafter, and the high water still continued at the close of the month. A report of this flood will appear in the REVIEW for June, 1905.

There were also some moderately high waters in the lower Ohio and tributaries as a result of the heavy rains on the 12th, but danger-line stages were not quite reached except in the Ohio at Evansville, Ind., and in the Wabash and Duck rivers. Warnings were issued whenever necessary between the Great Kanawha River and Cairo, Ill. About 10,000 acres of farm land were overflowed from the mouth of Green River to Henderson, Ky.; about 7000 acres on the Indiana, and 3000 acres on the Kentucky side. Most of this land was planted in